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IF4.

Finite Element Models with Patient Specific Wall Strength Estimations Improve Growth Predictions of Abdominal Aortic Aneurysms

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Objectives: Abdominal aortic aneurysms (AAA) grow in a discontinuous manner, and there is no reliable way to predict the growth rate of a specific aneurysm. In this study, we used finite element modeling (FEM) with estimations of patient-specific parameters, including wall strength and wall thickness, to find a biomechanical parameter that predicted AAA growth.

Methods: Included were 41 patients (nine women, 32 men) who had undergone two computed tomography angiographies (CTAs) within 9 to 18 months. Two FEM were made per CTA; one (standard) with and one (matched) without modeling influence of patient-specific age, sex, mean arterial pressure, and family history. Annual increases in volume and diameter were compared with baseline AAA volume, diameter, intraluminal thrombus (ILT) volume, mean wall stress (MWS), mean ILT stress (MIS), peak wall stress (PWS), and peak wall rupture risk (PWRR = maximal wall stress/wall strength ratio). Linear and nonlinear correlation was tested with Pearson product-moment and Spearman rank correlation coefficients.

Results: Standard baseline PWRR correlated with diameter growth ($r = 0.32$ $P = .040$). Baseline AAA volume ($r = 0.57$ $P = .0001$), diameter ($r = 0.53$ $P = .0003$), ILT volume ($r = .50$, $P = .0009$), standard ($r = 0.44$ $P = .0087$), and matched ($r = 0.32$ $P = .043$) PWRR and matched MIS ($r = 0.39$ $P = .013$) correlated with volume growth. PWS and MWS did not correlate with AAA growth.

Conclusions: PWRR, based on patient specific wall stress and strength estimations, can predict diameter and volume growth in our small sample. Because this parameter previously has been shown to predict rupture, it is promising as a future clinical predictor for AAA progression and outcome. Our results also suggest a role for the ILT in AAA expansion since both the mean stress and volume of the ILT correlated with AAA volume growth.

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IF5.

Renal Volume Analysis Following Endovascular and Open Aneurysm Repair

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Objectives: The purpose of this study was to compare renal outcomes (glomerular filtration rate (GFR) and renal volume) after endovascular (EVAR) and open AAA repair.

Methods: All AAA repairs performed between November 2009 and July 2011 were included in this retrospective study. Patients requiring suprarenal clamping and renal bypass or reimplantation, and requiring fenestrated endografting, were excluded from the open and EVAR groups respectively. All EVAR were performed with transrenal proximal fixation. Renal volume (calculated with a three-dimensional workstation), and GFR (estimated with the Modification of Diet in Renal Disease formula) were evaluated before the procedure, 12 months after, and yearly thereafter.

Results: Included were 91 patients (41 open and 50 EVAR). Both groups were comparable except for peripheral artery disease, arrhythmia, and vitamin K antagonist treatment. Median follow-up was 35.8 months (range, 29.8-36.7 months). In both groups, a similar significant decrease in right renal volume (9.41 cm^3; 95% confidence interval [CI], 3.55-15.27), left renal volume (12.67cm^3; 95% CI, 6,81-18,54 cm^3), and GFR (9.94 mL/min per 1.73 m^2; 95% CI, 3.93-15.95 mL/min per 1.73 m^2) were observed during follow-up ($P < .002$), despite no significant decrease in serum creatinine level during follow-up ($P = .056$).

Conclusions: Renal function impairment is similar after open and endovascular AAA repair. It is associated with a decrease in renal volume, which is a better marker of renal dysfunction than serum creatinine level.

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IF6.

Inflammatory Response and Renal Function Following TEVAR

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Objectives: Endovascular repair of abdominal and thoracic aortic aneurysms (EVAR, TEVAR) may induce a systemic inflammatory response characterized as the post-implantation syndrome. It has been suggested that this inflammatory response may influence renal function. The purpose of this study was to evaluate the inflammatory response and the renal function after TEVAR.

Methods: Thirty-two consecutive patients treated with TEVAR from January 2010 were enrolled in this prospective study. Temperature and serum levels of white blood cells (WBC), C-reactive protein (CRP), interleukin-10 (IL-10), interleukin-6 (IL-6), interleukin-8 (IL-8), tumor necrosis factor-α (TNF-α), creatinine, urea and cystatin-c were measured preoperatively and at 24 hours and 48 hours postoperatively.

Results: A statistically significant increase in temperature and serum levels of WBC, CRP, IL-10, and IL-6 was observed 24 and 48 hours postoperatively compared with baseline (all $P < .05$). The number of endografts and the coverage of the celiac or the subclavian artery did not affect the magnitude of the inflammatory response.